



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

certain conditions that the pool of water in which it lives is about to dry up, it proceeds to envelop itself in a cyst in which it lies preserved until the next rain. Now we could easily imagine some being *endowed with intelligence* making an automaton that would respond in a similar manner to set conditions. But the amoeba can do what no automaton could possibly do. It can adapt itself to new conditions if not too violent a change is made. It can *learn*, it must *experience*, and evolution is its account for the powers already acquired by ancestral experience. Ultimately, in all explanations of heredity, the powers of mind are tacitly conceded and if consciousness and mind in the higher animals are the results of evolution, it must be conceded that mind is present wherever there is protoplasm; and it may well be asked, are not all the properties exhibited by protoplasm (aside from such chemical and physical properties as it possesses in common with all other matter) of such a nature as to require terms borrowed from mental phenomena (*e. g. experience* and *idioplasm*). It is true that the activities of protoplasm are all of a physico-chemical nature and obey the law of the conservation of energy. But the problem of heredity is not primarily concerned with the physiology of protoplasm, but with problems of the origin of species, phylogenetic and ontogenetic questions that are totally foreign to chemical and physical phenomena. It is because of this that the problem of heredity becomes a psychological one, and for this reason psychology and biology are so intimately related; just as soon as psychology becomes a matter of research, rather than speculation, it needs the prefix *physiological*. In this connection consult:

"*La vie psychique des micro-organismes*" in *Études de psychologie expérimentale*. Paris, 1888. Also translated by Thomas McCormac. Open Court Publishing Company, Chicago, 1889.

As higher animals are congeries of cells and we may believe that the psychological phenomena of higher organisms are the resultants of the activities of the cells, it behooves us to study the psychology of the unicellular animals. We are wont to think of several cells as needful for a psychic process in man, but here we see all the psychic processes taking place without nerves and ganglia, as responses of protoplasm to the direct action of the environment. Perhaps it would be more proper to say that the protoplasm reacts, where it is useful or needful for it to do so, in *intelligent response* to the conditions of the environment. The environment is always acting upon the cell whether there is a response or not. Protozoa exhibit exquisite sensibility without sensory organs. Pigment spots (*chromatophores*) and lenticular bodies are usually present in forms that manufacture starch from carbon dioxide by means of the energy of the sun's light, so that these "eyes" appear to be nutritive rather than sensory organs, though possibly both. The maximum amount of absorption of the sun's energy corresponds with the bands of the spectrum complementary of the colors of the protoplasm, and at the same time the maximum amount of oxygen is excreted, as proved by the bacterial test. Besides touch, there must be smell or taste for great delicacy of choice of food is often experienced as in those forms that prey on a single species of plant or animal. Some of these (*Didinium nasutum*) throw darts ("trichocytes") at their victims at a distance to paralyze them. Pseudopodia and cilia are organs of motion. Some of the latter are automatic and others are under the control of the will. In sexual reproduction or conjugation there is exhibited a certain choice of certain individuals for each other. Then follows a series of evolutions or dancings about that may last for days; there is apparent a conflict between two impulses, one seeking union, the other a desire to escape; yet finally conjugation ensues. The spermatozoa and ova of higher animals are unicellular and unite under similar laws. The gen-

erative products are mutually attracted by the same impulses that bring the adults (gametophores) together. It has indeed been shown by Pfeffer that malic acid has an attraction for spermatozoa; malic acid is present in the neck cells of *Antheridia*, but this fails to explain the mutual attraction of the pronuclei in the egg. A spermatozoon will overcome considerable obstacles, or pass by round-about paths, to reach an egg. Weber's law has been found applicable to the sensibility of spermatozoa. The threshold is a solution containing  $\frac{1}{1000}$  of malic acid. If spermatozoa are placed in a solution of this or a higher strength they require a solution thirty times as strong to attract them; this ratio is constant. In the case of the spermatizoids of mosses the constant ratio is fifty for cane sugar.

If we now reflect on these facts, together with facts presented earlier, with regard to the rôle of the nucleus, the following conclusions appear safely deducible. The seat of consciousness, or at least of mind, is in the nuclear plasm, i. e. *the gemmules (chromatin granules) are endowed with psychic powers, and because of this they properly constitute the idioplasm.* We cannot leave the subject at this point, for we have premises from which very important conclusions may be drawn, and here the importance of the difference between the Kölliker and Weismann theories appears in its real light. According to one view there must be a very perfect localization of idioplasmic functions throughout the body, and this favors the localization of mental functions of a more advanced sort in the central nervous system. While according to the other view we have one part of the body as much the seat of the mind (or soul) as the other, while the apparent localization which we find is of a more extraneous nature and due to the position occupied by the cells. The gemmules of the eye and liver cells could be interchanged without interfering in the least with the functions of their organs and similarly for any ganglion cell in the center of apperception. In society this would be illustrated by taking the rail-splitter and placing him in the presidential chair, and the ex-president retiring to his farm. To Kölliker the soul of the state is the sum of the common consciousness of its citizens; according to the other theory it is the consciousness of the chief person in the realm. Every one realizes the fact that mental traits are as hereditary as physical ones; but that the learning acquired by the father is not congenital with children is simply because the reproductive cells were not concerned in the matter, but only certain brain cells. It is a special case of the non-inheritance of acquired characters. The mental acquisitions of the youth are retained by the man even though the cells concerned have multiplied in the meantime. This illustrates the law that whatever is acquired by cells is passed continuously on to their descendants. This law holds with the protozoa, and with the germinal cells as well. The conclusion to be drawn is that whatever is hereditary must have been the experience of the reproductive cells. If we could learn the nature of this germinal education we should be enabled to educate the unborn generations through our germinal cells. The Principles of Pedagogy have their roots in the study of the Biology of the Protozoa.

What is really done by the cells in a psychic process? Certainly a set of acts more special (i. e., not of so great a range of variable work) but of the same nature as that performed by the protozoa. All is reduced to stimulus and reaction, and the same process may take place with or without consciousness. The enquiry then becomes: Where is the seat of consciousness and what physiological processes condition conscious states? Is the egg conscious? All that appears in the body was in the egg. Are the reproductive cells, are the protozoa conscious? Probably one as much as the other. These metaphysical questions are biological

questions at bottom, and do not seem to be incapable of solution with a little careful thought and experimentation. The solution of all questions of this nature can come only when the various lines of biological research indicated in this paper are completed.

*Origin of the Fittest.* COPE.

In this connection the final chapters of this work offer many suggestive ideas. The earlier part of the work calls attention to the important phenomenon termed "acceleration," by which is meant that every time an ontogeny is repeated the characters appear at earlier and earlier periods, or in other words the developmental history is compressed to give room for the later added acquirements.

*Begriff und Sitz der Seele.* SCHMIDT. Heidelberg, 1887.

What is the seat of the soul? Is it a point or in a special portion of the body? If so, where? Or is it diffused wherever there is idioplasm? We first consult Schmidt. There are three forms of biological force, contends Schmidt, more and more unified, or active at a point, as we ascend the scale, viz., unconscious mind in the plant, consciousness in the animal, and self-consciousness in man. If the soul is the life of the body there must be a central point of life, and this he finds to be the *Nœud vital* of Flourens, because a destruction of the gray matter at the point of the *calamus* causes instant death. Here is the center to which cell sensations are carried, and from which all mandates of will are sent forth. He even indicates the paths by reference to Fick's "Phantom Brain!" Organisms begin in a mathematical point; the embryo is not formed from all the cells of the morula, but from a central point corresponding with the central point of the *germinal vesicle*. In the adult the *Nœud vital* is the center of the body, (the head representing concentrated segments). It is scarcely necessary to comment upon this theory. The author is not well enough versed in anatomy, embryology or physiology to know that not any of his statements are significant, and most are sadly erroneous. Death from the destruction of the structures in the *Nœud vital* ensues because the heart and breathing movements are innervated from these points. There is no proof whatever that consciousness resides here.

*Von dem Materiellen der Seele.* HITZIG, 1886.

This is a popular address calling attention to such facts as the increased circulation in the brain during mental work, the effect of drugs on conscious states, the effects of the removal of parts of the surfaces of the hemispheres, etc., to show that there is a material substratum for mind. The difference between man and animals lies in the power of the former to reason abstractly, while the latter depend on direct sensations. This difference is probably due to a difference of organization of the brain. If we are evolutionists we can look hopefully to the future, when the soul shall have made as great an advance beyond its present position as now it stands above the animal stage, then it may be able to understand itself.

*Das Körperliche Gefühl.* KRÖNER, pp. 220, Breslau, 1887.

This is a treatise on the development of the soul, and is based on biological laws. The mental protoplasm, out of which all mental powers have been evolved, is general bodily sensation or feeling. This includes simply the sensations of pleasure or of displeasure. Soul is declared to be wherever sensation intervenes between the stimulus and the reaction. A first group of bodily sensations are those not localizable, such as weariness, sleepiness, hunger, thirst, appetites, modesty, etc., all dependent upon general states of nutrition. This class of com-